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EPS 7000

Single Module and Shared Systems

Installation Manual

MGE
UPS SYSTEMS

IMPORTANT SAFETY INSTRUCTIONS

SAVE THESE INSTRUCTIONS – This manual contains important instructions for all EPS 7000 UPS Single Module, and Shared System that must be followed during operation of the equipment.

WARNING: **Opening enclosures expose hazardous voltages. Always refer service to qualified personnel only.**

ATTENTION: **L'ouverture des cabinets expose des tensions dangereuses. Assurez-vous toujours que le service ne soit fait que par des personnes qualifiees.**

WARNUNG! **Das öffnen der Gehäuse legen gefährliche Spannungen bloss. Service sollte immer nur von qualifizierten Personal durchgeführt werden.**

WARNING: **As standards, specifications, and designs are subject to change, please ask for confirmation of the information given in this publication.**

ATTENTION: **Comme les normes, spécifications et produits peuvent changer, veuillez demander confirmation des informations contenues dans cette publication.**

WARNUNG! **Normen, Spezifizierungen und Pläne unterliegen Anderungen. Bitte verlangen Sie eine Bestätigung über alle Informationen, die in dieser Ausgabe gemacht wurden.**

NOTE: **This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with installation manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.**

EPS 7000

Single Module and Shared Systems

Installation Manual

For service call
1-800-523-0142

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MGE
UPS SYSTEMS

EPS 7000
Installation Manual

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Revision History

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X0	R&D-001651	08/2004
X1	R&D-001943	01/2006

How To Use This Manual

This manual is designed for ease of use and easy location of information.

To quickly find the meaning of terms used within the text, look to the Glossary.

To quickly find a specific topic, look at the Table of Contents.

This manual uses Note lines and icons to convey important information.

Note lines and icons come in four variations.

WARNING: **Indicates information provided to protect the User and service personnel against safety hazards and possible equipment damage.**

CAUTION: **Indicates information provided to protect the User and service personnel against possible equipment damage.**

NOTE: **Indicates information provided as an operating tip or an equipment feature.**

IMPORTANT: **Indicates information provided as an operating instruction or as a tip.**

CAUTION

RECORD ALL SERIAL NUMBERS FOR THE UPS MODULE AND SSC.

THESE SERIAL NUMBERS WILL BE REQUIRED IF YOUR SYSTEM NEEDS SERVICE. KEEP THIS MANUAL IN A PLACE WHERE YOU CAN REFERENCE THE SERIAL NUMBERS IF SERVICE IS REQUIRED!

SINGLE MODULE SERIAL NUMBER: _____

SSC SERIAL NUMBER: _____

ADDITIONAL MODULE SERIAL NUMBERS:

UPS DESIGNATION:	**UPS SERIAL NUMBER:**
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
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Introduction

1.0 Scope

This manual provides technical information required for installation and maintenance of the EPS 7000 uninterruptible power system (UPS) single module and shared system. Please read this manual before installing the EPS 7000 equipment. Please retain this manual for future reference.

The EPS 7000 Users Manual, Single Module (MGE part number 86-134004-00) provides detailed operating instructions for single module systems; the EPS 7000 Users Manual, Shared Systems (MGE part number 86-134005-00) provides detailed operating instructions for shared systems.

1.1 Reference Manuals

86-134004-00 EPS 7000 Users Manual, Single Module
86-134005-00 EPS 7000 Users Manual, Shared System

1.2 Section Descriptions

This manual is divided into four sections:

Section 1 Introduction

This section introduces the EPS 7000 uninterruptible power system Single Module and Shared Systems, receiving, handling, and storage procedures; including a general description of system specifications.

Section 2 Descriptions, Single Module and Shared System

This section is a general description of the EPS 7000 single-module and shared systems, their internal components, diagrams, and available system options.

Section 3 Installation, Single-Module and Shared System

This section describes the installation for EPS 7000 single module and shared systems. Including cabinet connections, mains1 & 2, AC Bypass Input/Outputs, and the Battery. Each paragraph is titled for single module or shared system descriptions when applicable.

Section 4 Maintenance

This section describes maintenance of the EPS 7000, including safety instructions, preventive maintenance, and information about replacement parts.

A Glossary in the rear of this manual provides definitions of terms used within the text.

1.3 General Description

EPS 7000 is a family of compact, high-efficiency uninterruptible power systems. Standard power ratings for single-module systems range from 300 to 500 kVA, while standard shared systems are rated up to 4000 A. EPS 7000 UPS are optimized for compatibility with non-linear computer-type loads. Computer-aided UPS diagnostics and modular construction assures that any required service on the UPS can be identified and completed rapidly. Remote system monitoring, remote annunciation of UPS performance signals, and telecommunication capabilities allow total control of the UPS by the user.

The EPS 7000 , SSC, battery, and all auxiliary equipment is listed for safety by Underwriter's Laboratories, Inc. (UL) under UL Standard 1778 and under Canadian Standards Association (CSA) standard C22.107.

Major components of the EPS 7000 family include:

- UPS module
- SSC static switch cabinet
- SSC maintenance bypass cabinet
- UPS maintenance bypass cabinet
- Transformer cabinet (if required)
- Battery disconnect

Each of these cabinets is described below. Figure 1-1 shows a single-module UPS. Figure 1-2 shows a shared-system (SSC) installation. Tables 1-1, 1-2, 1-3 identify single-module 500 kVA ratings.

Figure 1-1: EPS 7000 System, Single-Module Configuration, 1 Optional GCC per Module (not shown)

Figure 1-2: EPS 7000 System, S-S Configuration, 1 Optional GCC per System Located on the SSC (not shown)

1.4 Receiving for Single Modules and Shared Systems

Before accepting the shipment from the freight carrier, inspect the exterior surfaces of all shipping containers or packaging used, and the equipment, for damage that may have occurred during transit. If the shipping containers or equipment show evidence of damage, note the damage on the receiving document (bill of lading) prior to signing for receipt of equipment.

The equipment should be unpacked immediately after receipt, and inspected again to determine if any internal shipping damage (broken components, disconnected wiring, loose connections, etc.) has occurred. Verify that the equipment nameplate(s) correspond with the equipment ordered.

Damage claims should be filed directly with the carrier. Replacements for damaged components should be ordered through MGE Customer Support Services at 1-800-523-0142.

1.4.1 Handling

Carefully follow the handling instructions attached to the shipping materials.

1.4.2 Storage

If the equipment is to be stored prior to installation, it should be stored in a cool, dry, well-ventilated location that is protected against rain, splashing water, chemical agents, etc. The equipment should be covered with a tarpaulin or plastic wrapper to protect it against dust, dirt, paint, or other foreign materials.

IMPORTANT: **Batteries should be stored no longer than three (3) months at 25° C (77° F) or lower prior to recharging. Exceeding the recommended ambient storage temperature will induce battery back-up time and may adversely affect battery life.**

1.4.3 Prerequisites to Installation

An efficient EPS 7000 installation depends on careful planning and site preparation. Installation of UPS equipment must be handled by skilled technicians and electricians familiar with the special requirements of high-energy electrical equipment. The installation must comply with the requirements of the National Electrical Code (NEC, ANSI/NFPA 70, latest issue) and with local codes and requirements as applicable.

Before installation, the following environmental, mechanical, and electrical prerequisites must be fulfilled.

Carefully review the installation drawings supplied with the system and follow their instructions.

1.4.4 Environmental Considerations

The EPS 7000 is intended for use in an environment where control of temperature and humidity is provided.

The EPS 7000 generates heat and exhaust air through the top portion of its enclosures. Heat loss and air flow data is provided in the installation drawings.

1.4.5 Mechanical Considerations

The EPS 7000 can be mounted on a raised floor, or flush-mounted on a concrete floor. All floors must be level. The conduits are landed on a panel located on left top panel of the module as shown on the installation drawings. On a raised floor the unit can be equipped with an optional auxiliary cabinet to allow conduits to be run below the floor.

Battery cabinet(s) may be placed adjacent to the UPS module on the right side (when viewed standing in front and facing the module), or may be installed as stand-alone cabinets. Auxiliary cabinet(s) are placed to the left of the UPS module.

Floor loading must be considered when installing an EPS 7000 system on a raised floor or on an upper story of a multiple-story building. Floor loading data is provided on the installation drawings supplied with the equipment. Consult a structural engineer while planning your EPS 7000 UPS installation.

After installation, the EPS 7000 module requires a minimum of 1 meter (36 inches) front and top clearance for normal maintenance. Side or rear access is not required.

IMPORTANT: **Side or rear access may be required for installations where cable restraints are necessary.**

1.4.6 Electrical Considerations

Electrical service for the EPS 7000 system should be supplied on its own dedicated branch circuit. Main input cables, upstream protective devices, and downstream protective devices must be provided and sized per the National Electrical Code (NEC) requirements, per local codes as applicable, and as appropriate for your load and distribution requirements. Recommended cable sizes and UPS ratings are provided on the installation drawings. The EPS 7000 is a separately-derived source.

1.5 UPS Single Module and Shared System Specifications

Specifications provided refer to an EPS 7000 module and any required auxiliary cabinets.

1.5.1 Electrical Ratings

Table 1-1: System Electrical Characteristics

Rating, KVA/KW	300/270	400/360	500/450	300/270	400/360	500/450
Input voltage	480VAC, 3PH, 3W+G, 60hz.	480VAC, 3PH, 3W+G, 60hz.	480VAC, 3PH, 3W+G, 60hz.	600VAC, 3PH, 3W+G, 60hz.	600,VAC,3PH, 3W+G, 60hz.	600VAC, 3PH, 3W+G, 60hz.
Phase Rotation	ABC clockwise	ABC clockwise	ABC clockwise	ABC clockwise	ABC clockwise	ABC clockwise
Input Current	371 amps nominal, 543 amps max.	508 amps nominal, 688 amps max.	656 amps nominal, 840 amps max.	322 amps nominal, 466 amps max.	441 amps nominal, 586 amps max.	569 amps nominal, 711 amps max.
Output Voltage	480VAC, 3PH, 3or4W+G, 60hz.	480VAC, 3PH, 3or4W+G, 60hz.	480VAC, 3PH, 3or4W+G, 60hz.	600VAC, 3PH, 3or4W+G, 60hz.	600VAC, 3PH, 3or4W+G, 60hz.	600VAC, 3PH, 3or4W+G, 60hz.
Output Current	361 amps	481 amps	601 amps	289 amps	385 amps	481 amps
Bypass voltage	480 VAC, 3PH, 3or4W+G, 60hz.	480VAC, 3PH, 3or4W+G, 60hz.	480VAC, 3PH, 3or4W+G, 60hz.	600VAC, 3PH, 3or4W+G, 60hz.	600VAC, 3PH, 3or4W+G, 60hz.	600VAC, 3PH, 3or4W+G, 60hz.
Bypass Current	361 amps	481 amps	601 amps	289 amps	385 amps	481 amps
DC Float Voltage	545 VDC	545 VDC	545 VDC	545 VDC	545 VDC	545 VDC
DC Nominal Voltage	480 VDC	480 VDC	480 VDC	480 VDC	480 VDC	480 VDC
DC Cut-off Voltage	390 VDC	390 VDC	390 VDC	390 VDC	390 VDC	390 VDC
DC Current (max)	721 amps	962 amps	1195 amps	721 amps	962 amps	1195 amps
Q1 Rating	1000AT/1200AF	1000AT/1200AF	1000AT/1200AF	1000AT/1200AF	1000AT/1200AF	1000AT/1200AF
Q4S, Q5N, SW	800AT/1200AF	800AT/1200AF	800AT/1200AF	700AT/1200AF	700AT/1200AF	700AT/1200AF
QF1 Rating	700AT/1200AF	1000AT/1200AF	1200AT/1200AF	700AT/1200AF	1000AT/1200AF	1200AT/1200AF

NOTE: Information provided is for standard configurations; data may change with optional equipment. Consult the installation drawings provided with your equipment.

1.5.2 Output

Power factor:	0.9 lagging
Total harmonic distortion	< 2% (linear load)
(THD):	< 4% (for 100% non-linear load with a crest factor of up to 3.5)
Transient regulation:	± 1% for balanced load ± tbd for 100% unbalanced load
Transient response:	± tbd for 100% step load change
Overload:	125% of rated load for 10 minutes (750-800 kVA), 10 minutes (555-625 kVA), 150% of rated load for 1 minute

1.5.3 Mechanical

Height:	82 in/2083 mm
Depth:	39 in/991 mm
Width:	See Table 2-1
Weight:	See Table 2-1
Finish:	MGE light gray

1.5.4 Environmental

Recommended environment:	20° to 25° C (68° to 77° F); 50% relative humidity; computer room or other temperature- and humidity-controlled environment
Operating temperature:	0° to 40° C (32° to 86° F) except battery
Storage:	-20° to 50° C (-4° to 122° F)
Humidity:	up to 90% non-condensing (operating)
Altitude:	sea level to 1,000 meters (sea level to 3,280 feet) without derating; 1,000 to 2,000 meters (3,280 to 6,560 feet): derate operating temperature to a maximum of 28° C (82° F)

2.0 Single-Module Description

This section is a general description of the EPS 7000 single-module and shared systems, their internal components, diagrams, and available system options. See Single Module and Shared Systems , Users Manual 86-1340004-00 for operation.

Figure 2-1: Typical Single-Line Diagram, (480 VAC Input/Output Single Module 500 kVA UPS with Battery Disconnect)

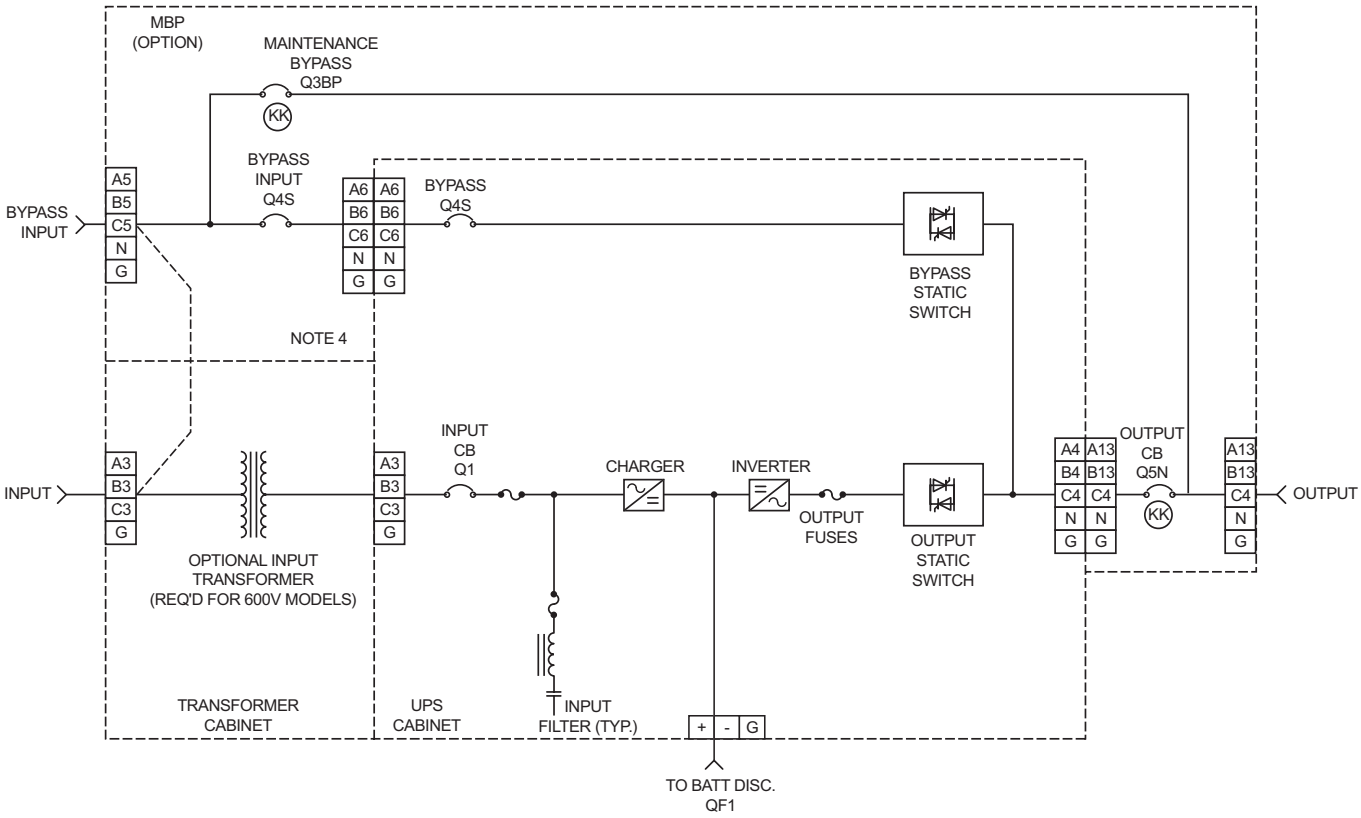
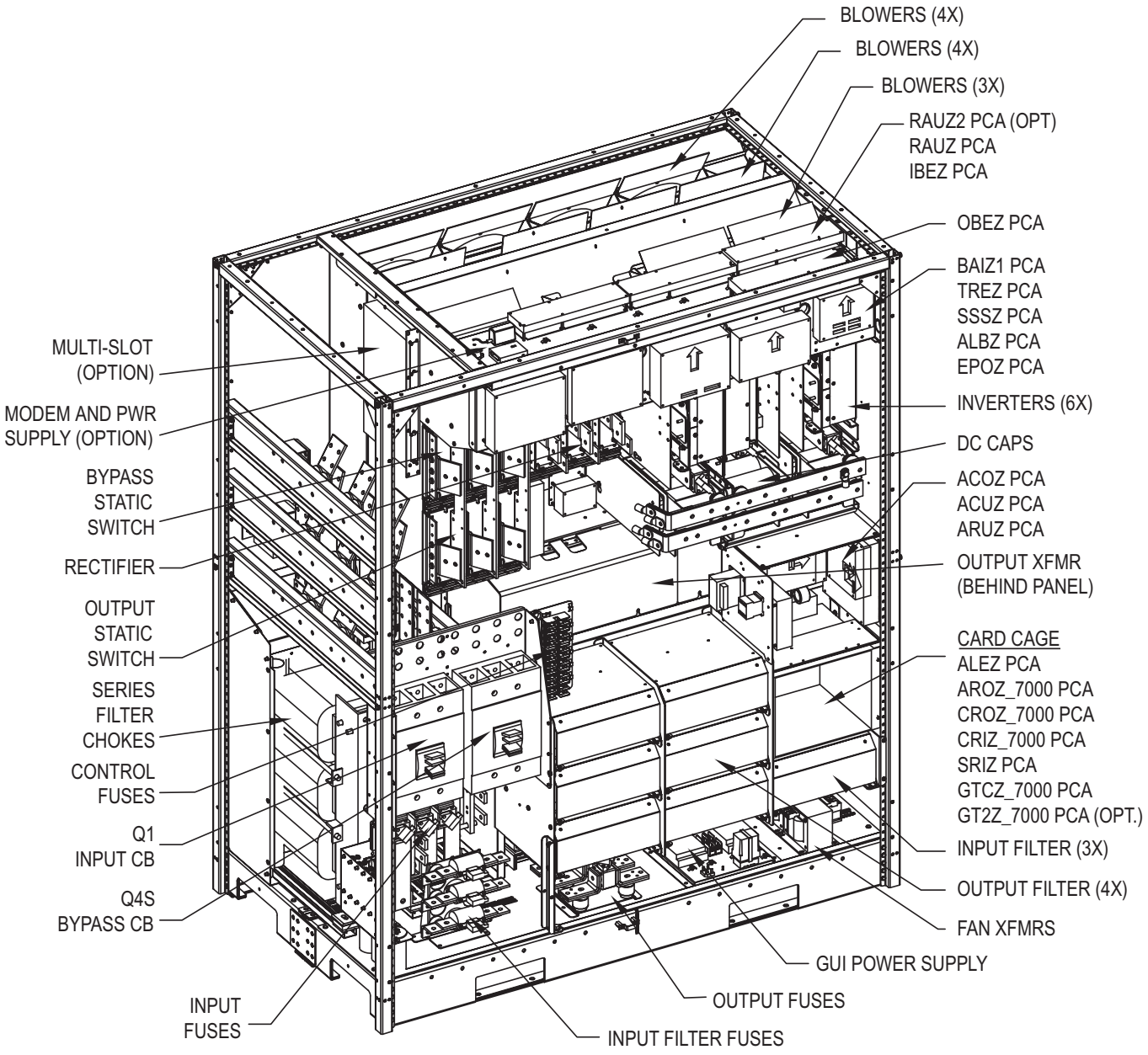


Table 2-1: EPS 7000 Single Module Ratings

WEIGHT (LBS/KG)			UPS	MBP	XFMR	TOTAL
300/400/500 kVA	Single Module	480V	6,900/3,130	540/245	OPT	7,440/3,375
60hz		600V	6,900/3,130	540/245	3,600/1,640	11,040/5,015

2.0.1 Single-Module Internal components

Figure 2-2: EPS 7000 Major Internal Components (Single Module 500 kVA UPS)



2.0.2 Single Module Major Internal Components

Input Filter An input harmonic current filter is standard.

Input Transformers The single-module is equipped with isolation transformer at the output and an optional transformer at the input. The transformers provide battery isolation or voltage step-up or step-down as required for the particular installation.

Rectifier/Battery Charger The rectifier/battery charger converts the AC input voltage from the utility source into a DC voltage, supplying the inverter and regulating the charge of the battery system. A capacitor bank filters the DC voltage.

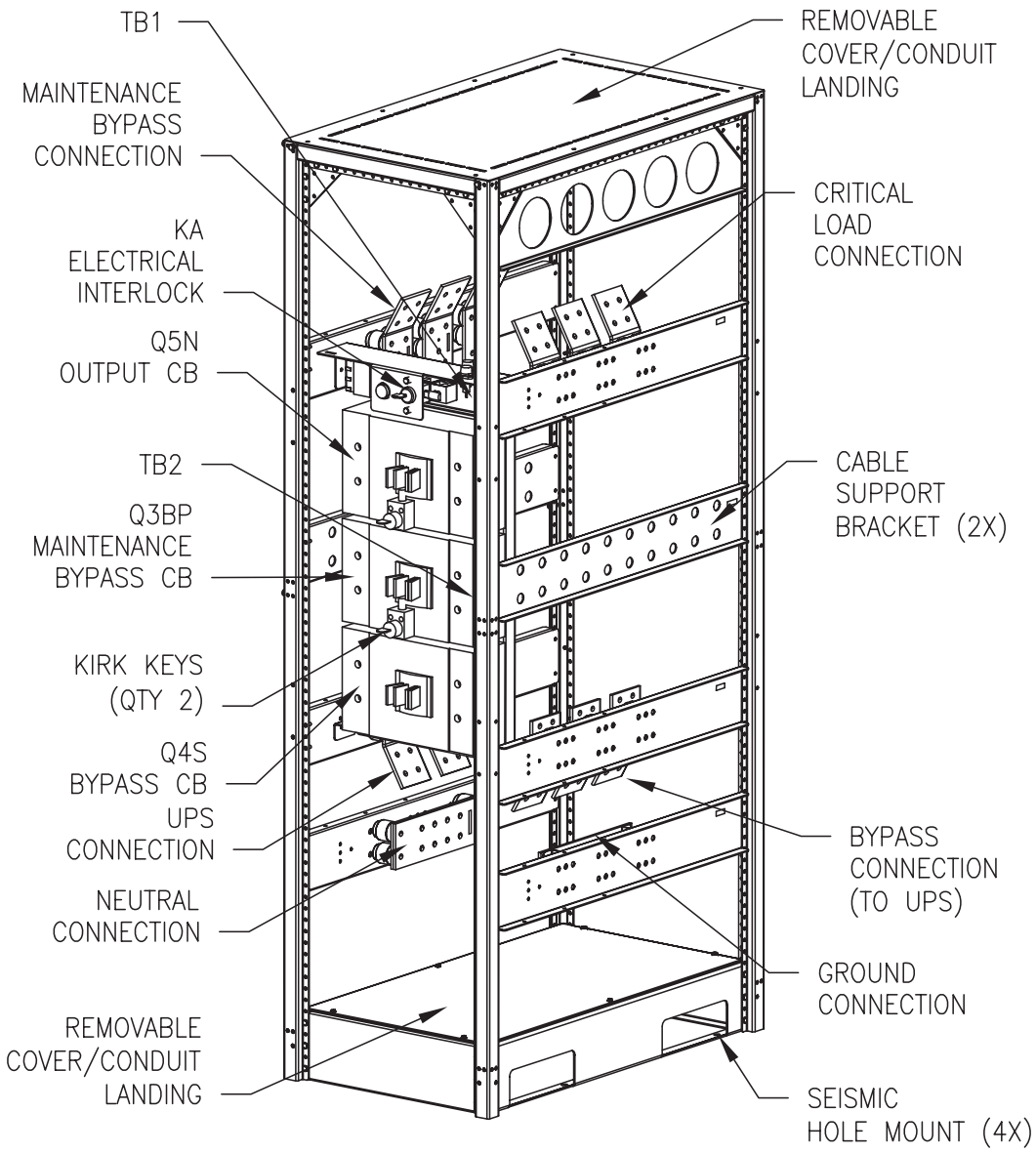
Inverter The inverter chops the DC voltage supplied from either the rectifier/battery charger or the battery system into a three-phase AC voltage. An AC output filter is used to achieve a computer-grade sinewave output voltage waveform, with a total harmonic distortion of less than 2% under linear-load conditions.

Static Switches An output and a bypass static switch is provided to transfer the critical load from ups output power to bypass input power without interrupting the supply of power to the load, allowing the load to continue operation while the UPS is being maintained, or in the event of a UPS fault. The static bypass switch assures that voltages from the UPS output cannot feed back to the utility input lines.

Bypass Cabinet The UPS is designed to use either a single bypass circuit breaker (Q4S) Figure 1-6, or a three-cb maintenance bypass. The three-cb maintenance bypass provides a direct bypass AC input source to supply the critical load while the UPS is being serviced.

Inverter Transformer During normal operation, the inverter transformer provides complete electrical isolation between the UPS output to the attached load and the utility power source input as well as the UPS battery source.

Figure 2-3: Circuit Breaker locations in Maintenance Bypass Cabinet



2.0.3 Single Module Options

This section describes options available for the EPS 7000. Some configurations do not support some options. Most options must be specified at the time of equipment order, and some options can be installed in the field. Contact your MGE dealer for complete information.

Main Battery Disconnect The battery disconnect provides isolation of the battery circuit from the UPS and also provides overload protection for the battery circuit. It is housed in a separate enclosure and can be floor mounted against a wall.

Battery System The battery system stores energy for use by the inverter. The stored energy is utilized in the event that the AC input power from the utility source fails, or falls outside of acceptable tolerance. The battery system may be a customer-supplied battery installation.

Remote Alarm Status Panel (RASP)

For single-module systems, a remote alarm status panel (RASP) is available. The RASP allows the following status indications to be viewed from a remote location:

- UPS on line
- UPS on battery
- UPS on bypass
- UPS on maintenance bypass
- Low battery shutdown
- Charger on
- Overload
- Charger fault
- Inverter fault
- Transfer lockout
- Summary alarm

Additionally, the RASP contains an audible alarm and two pushbuttons:

- UPS test/reset pushbutton
- Audio reset pushbutton

Remote Summary Alarm Panel (RSAP)

For single-module systems, a remote summary alarm panel (RSAP) is available. The RSAP allows the following status indications to be viewed from a remote location:

- UPS summary alarm
- UPS on battery

Additionally, the RSAP contains an audible alarm and two pushbuttons:

- Alarm test/reset pushbutton
- Audio reset pushbutton

Active RS-232/RS-485

A communications port is available that allows the UPS module or the SSC to be monitored from a remote terminal or computer. For detailed information on the communication features, contact your MGE dealer.

2.1 Shared System Description

This section describes the shared system in detail, including single line diagrams, rating and component locations. See Shared Systems, Users Manual 86-134005-00 for operation.

Figure 2-4: Typical Single Line Diagram, (480 VAC Input/Output Multi-Module UPS with Battery Disconnect.)

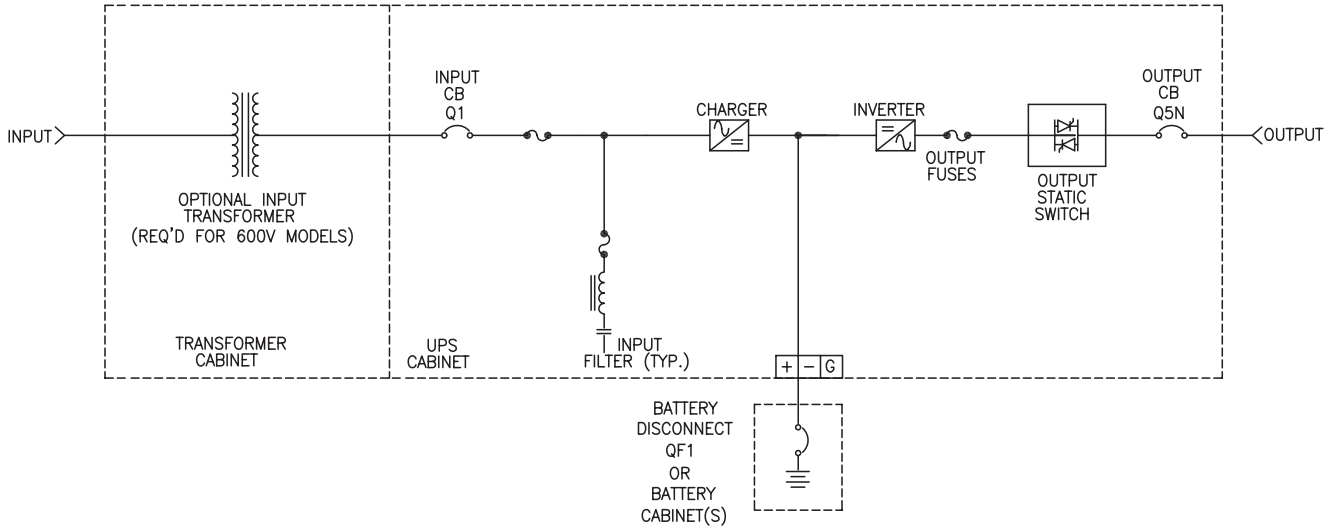


Table 2-2: EPS 7000 Shared Systems Ratings

WEIGHT (LBS/KG)			UPS	MBP	XFMR	TOTAL
300/400/500 kVA	Shared system	480V	6,800/3,090	NA	OPT	6,800/3,090
60hz		600V	6,900/3,130	NA	3,600/1,640	10,500/4,770

Table 2-3: Model Number, Static Switch Cabinets (SSC)

INPUT VOLTAGE (VAC)	OUTPUT VOLTAGE (VAC)	INPUT CB (Amps)	TOTAL WIDTH (mm/in)	TOTAL WEIGHT (kg/lb)	HEAT LOSS (Btu/hr)
480	480	4000 Max	1829/72	1317/2900	(Negligible)
600	600	4000 Max	1829/72	1317/2900	(Negligible)

Figure 2-5: Single-Line Diagram, typical EPS 7000 Shared Installation

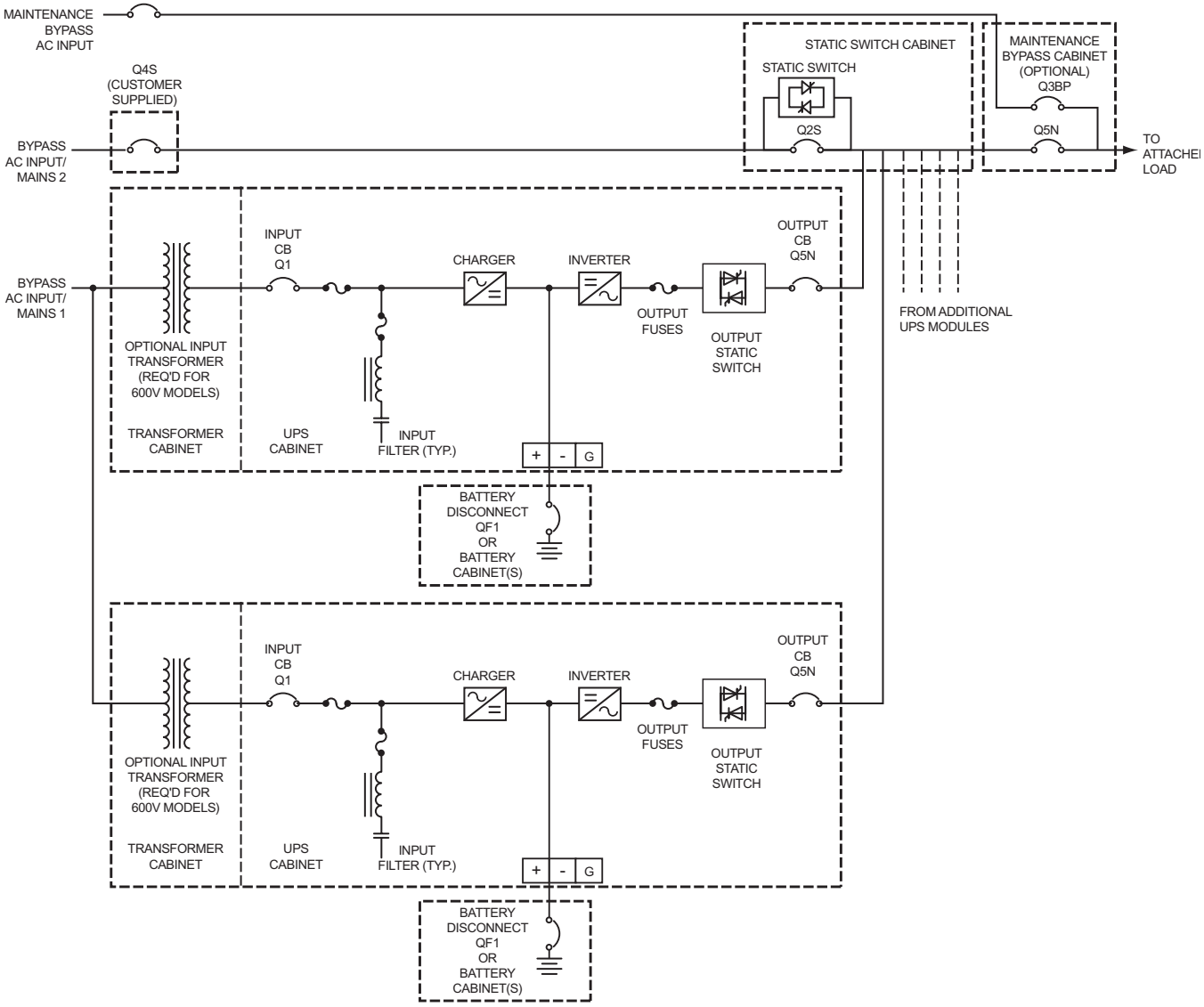
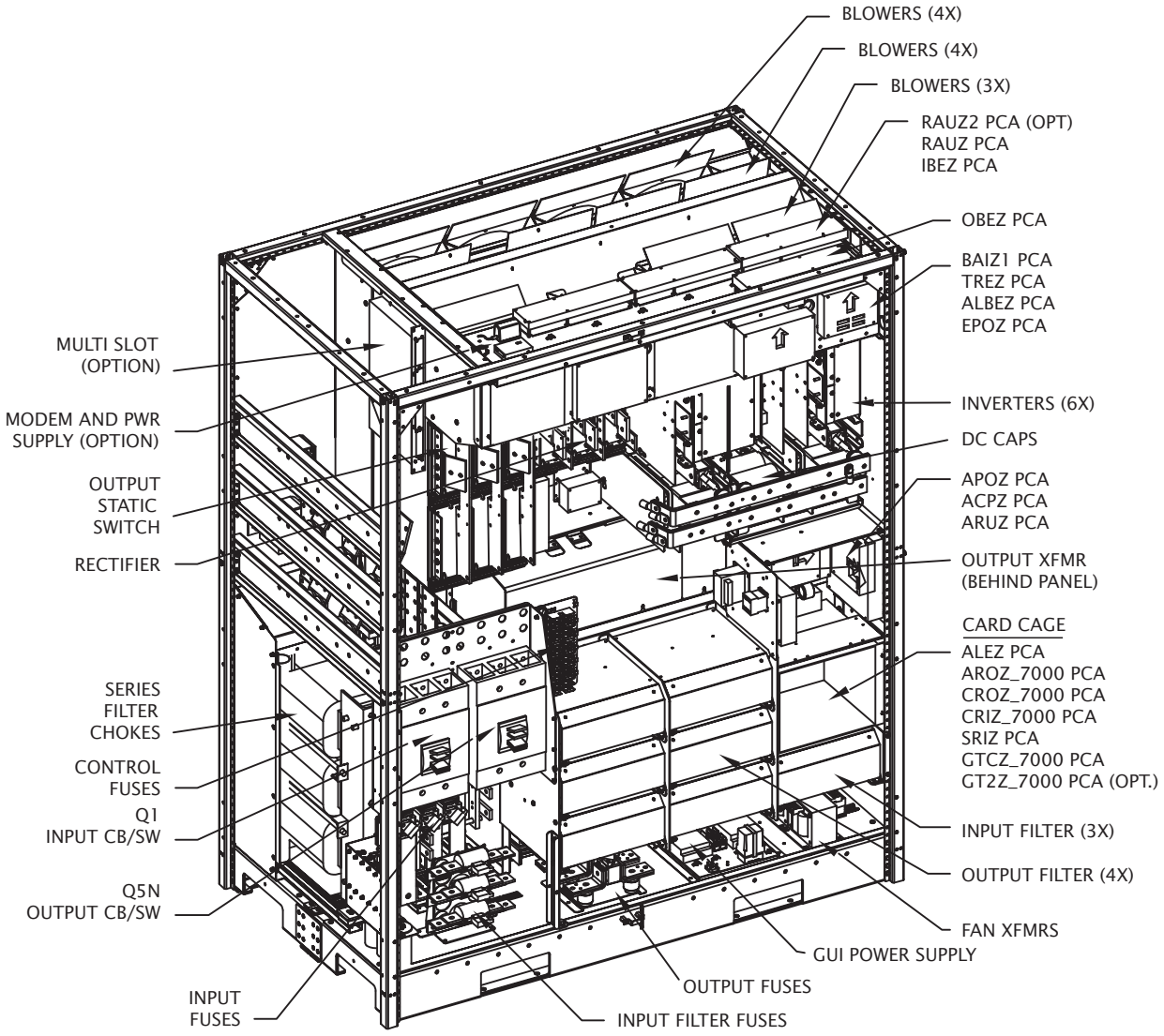


Figure 2-6: EPS 7000 Major Internal Components, Shared System UPS



2.1.1 Shared System Major Internal Components

Input Filter — An input harmonic current filter is standard.

Input Transformers — The single-module is equipped with isolation XFRMS on both the input and output. The transformers provide battery isolation or voltage step-up or step-down as required for the particular installation.

Rectifier/Battery Charger — The rectifier/battery charger converts the AC input voltage from the utility source into a DC voltage, supplying the inverter and regulating the charge of the battery system. A capacitor bank filters the DC voltage.

Inverter — The inverter chops the DC voltage supplied from either the rectifier/battery charger or the battery system into a three-phase AC voltage. An AC output filter is used to achieve a computer-grade sinewave output voltage waveform, with a total harmonic distortion of less than 2% under linear-load conditions.

Static Switch — An output static switch is provided to connect the ups output power to the SSC.

Inverter Transformer — During normal operation, the inverter transformer provides complete electrical isolation between the UPS output to the attached load.

2.1.2 Shared System Options

This section describes options available for the EPS 7000 *series 800* UPS. Some configurations do not support some options. Most options must be specified at the time of equipment order; some options can be installed in the field. Contact your MGE dealer for complete information.

Maintenance bypass — For the UPS modules, maintenance bypass is provided by the SSC, allowing any or all attached UPS modules to be taken off-line while the SSC supports the attached load from its bypass source. As an option, the SSC can be equipped with its own maintenance bypass, allowing the SSC as well as any/all attached UPS modules to be serviced while the load is supported by the maintenance bypass AC input source.

Active RS-232/RS-485 — A communications port is available that allows the UPS module or the SSC to be monitored from a remote terminal or computer. For detailed information on the communication features, contact your MGE dealer.

Main Battery Disconnect — The battery disconnect provides isolation of the battery circuit from the UPS and also provides overload protection for the battery circuit. It is housed in a separate enclosure and can be floor mounted against a wall.

Battery System — The battery system stores energy for use by the inverter. The stored energy is utilized in the event that the AC input power from the utility source fails, or falls outside of acceptable tolerance.

The battery system may be a customer-supplied battery installation.

Remote Alarm Status Panel (RASP)

For single-module systems, a remote alarm status panel (RASP) is available. The RASP allows the following status indications to be viewed from a remote location:

- UPS on line
- UPS on battery
- UPS on bypass
- UPS on maintenance bypass
- Low battery shutdown
- Charger on
- Overload
- Charger fault
- Inverter fault
- Transfer lockout
- Summary alarm

Additionally, the RASP contains an audible alarm and two pushbuttons:

- UPS test/reset pushbutton
- Audio reset pushbutton

Remote Summary Alarm Panel (RSAP)

For single-module systems, a remote summary alarm panel (RSAP) is available. The RSAP allows the following status indications to be viewed from a remote location:

- UPS summary alarm
- UPS on battery

Additionally, the RSAP contains an audible alarm and two pushbuttons:

- Alarm test/reset pushbutton
- Audio reset pushbutton

2.2 SSC Major Internal Components

The static switch cabinet (SSC) provides an electrical path between the output of the UPS modules and the load. When the UPS modules are off, the SSC provides power to the load from the bypass AC input source (mains 2). Up to six (6) modules can be connected to the SSC, supporting loads as great as 4000 amps. UPS modules may be turned off individually for maintenance, provided that the remaining modules can support the load.

The SSC incorporates a static bypass switch. A wrap-around circuit breaker (Q2S) in the SSC switches between the UPS module output and the bypass AC input source (when the UPS modules are off). Optionally, the SSC can be provided with its own maintenance bypass cabinet (MBP), allowing the SSC and/or any attached UPS module to be serviced while the load is supplied via the maintenance bypass AC input source.

2.2.1 Static Switch Cabinet Specifications

2.2.1.1 Electrical

AC input ratings

Voltage:	480 VAC, +10%, -10%
Frequency:	60 Hz, ± 10%
Phases:	3 Ø (phase sequence must be A, B, C)
Wires:	3 or 4 wires plus ground
Current:	4,000 Amperes max

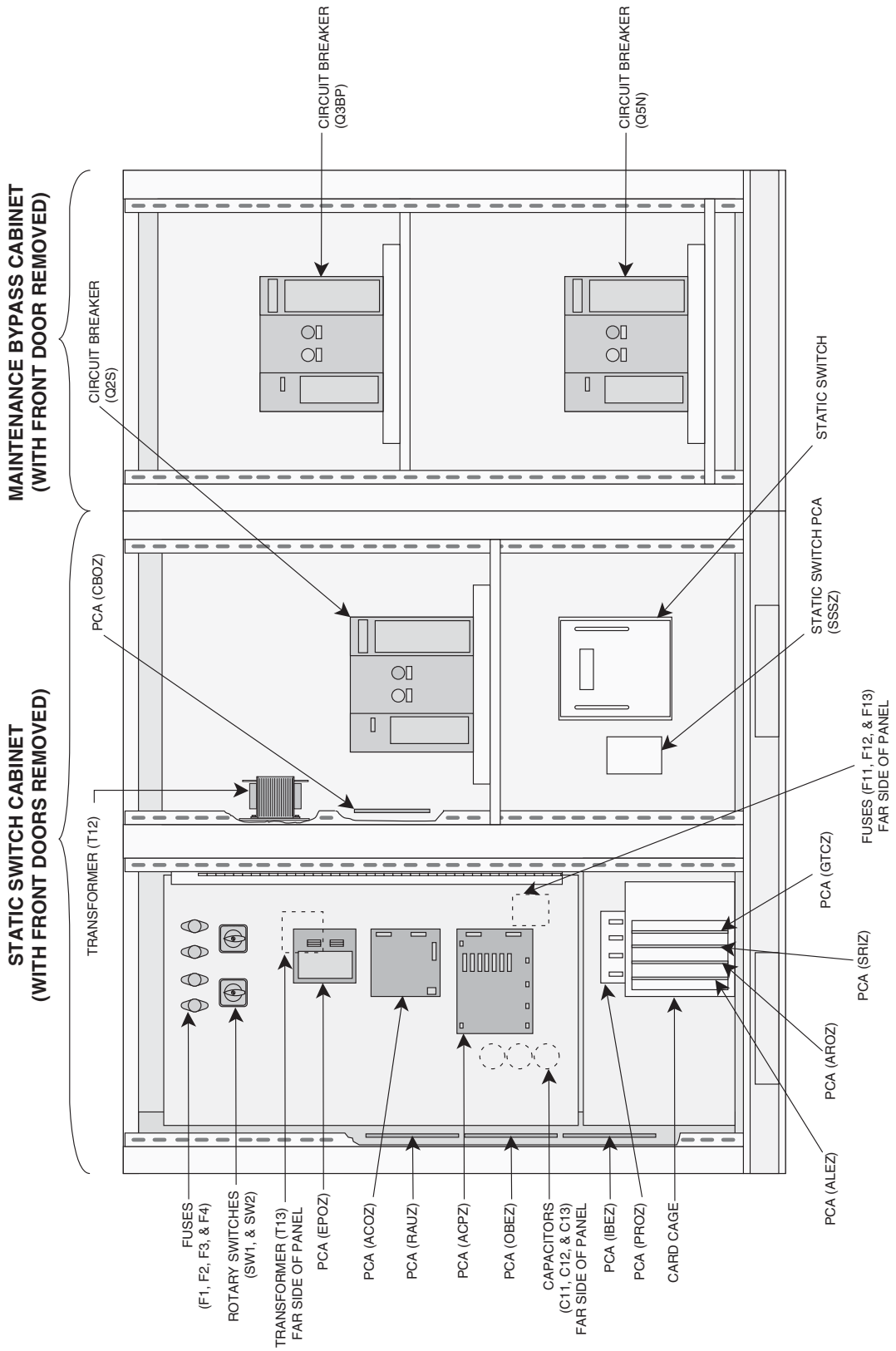
AC output ratings

Voltage:	480 VAC, 380/400/415 VAC
Frequency:	60 Hz, 50 Hz
Phases:	3 Ø
Wires:	4 wires plus ground
Current:	4,000 Amperes max
Power factor:	0.9 lagging

2.2.1.2 Mechanical

Height:	1,981 mm/78 in.
Depth:	1,219 mm/48 in.
Width:	1,829 mm/72 in.
Weight:	1,310 kg/2,900 lbs. (SSC) 1,091 kg/2,000 lbs. (MBP)
Finish:	MGE light gray

Figure 2-7 EPS 7000 Major Internal Components, Static Switch Cabinet (SSC)



3.0 Installation For Single Module and Shared Systems

This section describes the installation for EPS 7000 single module and shared systems. Including inter-cabinet connections, mains1 & 2, AC bypass input/outputs, and the battery. Each paragraph is titled for single module or shared system descriptions when applicable.

The steps to be followed are:

- Familiarization with information provided in the document package located behind the door of the unit.
- Placement of the UPS module and applicable battery and auxiliary cabinet(s).
- Connection of input power, output power, and inter-cabinet control and power cables.
- Start-up of the system.

Installation of UPS equipment must be handled by skilled technicians and electricians familiar with the special requirements of high-energy electrical equipment. The installation must comply with the requirements of the National Electrical Code (NEC, ANSI/NFPA 70, latest issue) and with local codes and requirements as applicable.

3.1 UPS Placement for Connections

Move the EPS 7000 module, battery cabinet(s) (if any), and auxiliary cabinet(s) (if any), to their final location, as described in the Mechanical considerations section. For cabinets installed adjacent to each other, alignment is critical to properly install the spacers and cabinet interconnects. Refer to the installation drawings for handling, moving the cabinet, placement, alignment, and mechanical connections.

Remove the packing materials and lift the enclosures to remove the pallets. Refer to the handling instructions and installation drawings supplied with the equipment for pallet removal procedures.

3.1.1 Noise

Consideration should be given to the specific location of the cabinet to minimize the potential for sound transmission to surrounding structures and sound reflection. It is suggested that the following installation methods be included.

1. If possible, mount the cabinets away from corners of walls or ceilings. For installations which must be near a corner, use sound absorbing materials on the walls and ceilings, if necessary, to eliminate reflection.
2. Provide a solid foundation for mounting the cabinets.
3. Provide flexible conduit to make the connections to the I/O cabinet.
4. Locate the cabinets as far as practically possible from areas where high sound levels are undesirable.

3.2 Connections

Install conduits and cables starting from the rear of the cabinet working your way to the front. Preferred conduit layout is shown on the installation drawing.

3.2.1 Single Module Connections

Electrical connections and cabinet interconnection will vary depending upon the configuration of your EPS 7000 system. Refer to the installation drawings supplied with your equipment. General information follows.

Before making any electrical connections, verify that the UPS circuit breakers Q1, Q4S, and optional Q3BP and Q5N are in the OFF (open) position. The battery disconnect circuit breaker QF1 should be in the OFF (open) position (if there is more than one, all should be in the OFF position). Optional distribution circuit breakers should be in the OFF (open) position. Customer-supplied downstream protective devices and distribution circuits should be OFF (open).

The lugs used to secure the cables should be torqued as per the recommendation listed in “Cable preparation for field wiring,” MGE document 9-00038-00.

3.2.2 Shared Systems Connections

Electrical connections and cabinet interconnection will vary depending upon the configuration of your EPS 7000 shared UPS system. Refer to the installation drawings supplied with your equipment. General information follows.

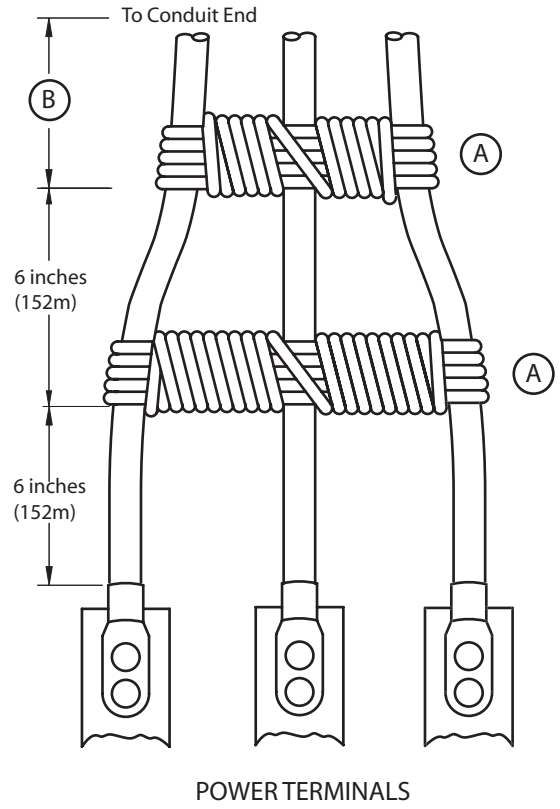
Before making any electrical connection, verify that the SSCs circuit breakers and switches Q5N, Q3BP, SW1, and SW2 are in the OFF (open) position. For each UPS module, verify that the main AC input circuit breaker Q1, the UPS module isolation circuit breaker Q5N, and all the battery disconnect circuit breakers QF1 are in the OFF (open) position. Customer-supplied upstream (Q4S) and downstream protective devices and distribution circuits should be OFF (open).

The lugs used to secure the cables should be torqued as per the recommendation listed in “Cable preparation for field wiring,” MGE document 9-00038-00.

3.2.3 Installations with More Than 50,000 Amps Available Fault Current.

Where available fault current exceeds 50,000 amps, follow recommended cable restraints as shown in Figure 3-1.

Figure 3-1: Cable Restraint Configuration for Fault Currents Exceeding 50,000 Amps. (UL891)



CAUTION: HAZARD OF CONDUCTOR MOVEMENT UNDER SHORT-CIRCUIT CONDITIONS.

Restrain conductors in installations where available fault current exceeds 50kva.

Failure to observe these precautions can result in conductors pulling out of the lugs or damage to this equipment.

Wrap line cables together and secure cables using:

(A) Nominal 3/8-inch (9.5m) Nylon rope or rope having a minimum tensile strength of 2000 Lbs (8896 N) at 6 inches (152m) and 12 inches (305mm) from the terminals with five wraps, and

(B) every additional 6 inches with five wraps or every 1 inch (25.4m) with one wrap.

IMPORTANT: Hazard of conductor movement under short-circuit conditions.

Restrain customer bypass conductors where available fault currents exceeds 50,000 amps.

3.3 Main AC Input, (Mains 1) Connections

The connections to be made are the three phase and ground cables from the utility AC power source to the UPS module. Complete wiring instructions for your installation are provided on the installation drawings supplied with the equipment.

3.3.1 Single Module Bypass AC Input (Mains 2) Connections

The connections to be made are the three phase, ground, and optional neutral cables from the bypass AC input (mains 2) power source to the Q4S or MBP cabinet.

Where a single AC input source is used to supply both main AC input (mains 1) and bypass AC input (mains 2) connections, the bypass AC input is derived from the main AC input by a set of jumpers. These jumpers are installed at the factory.

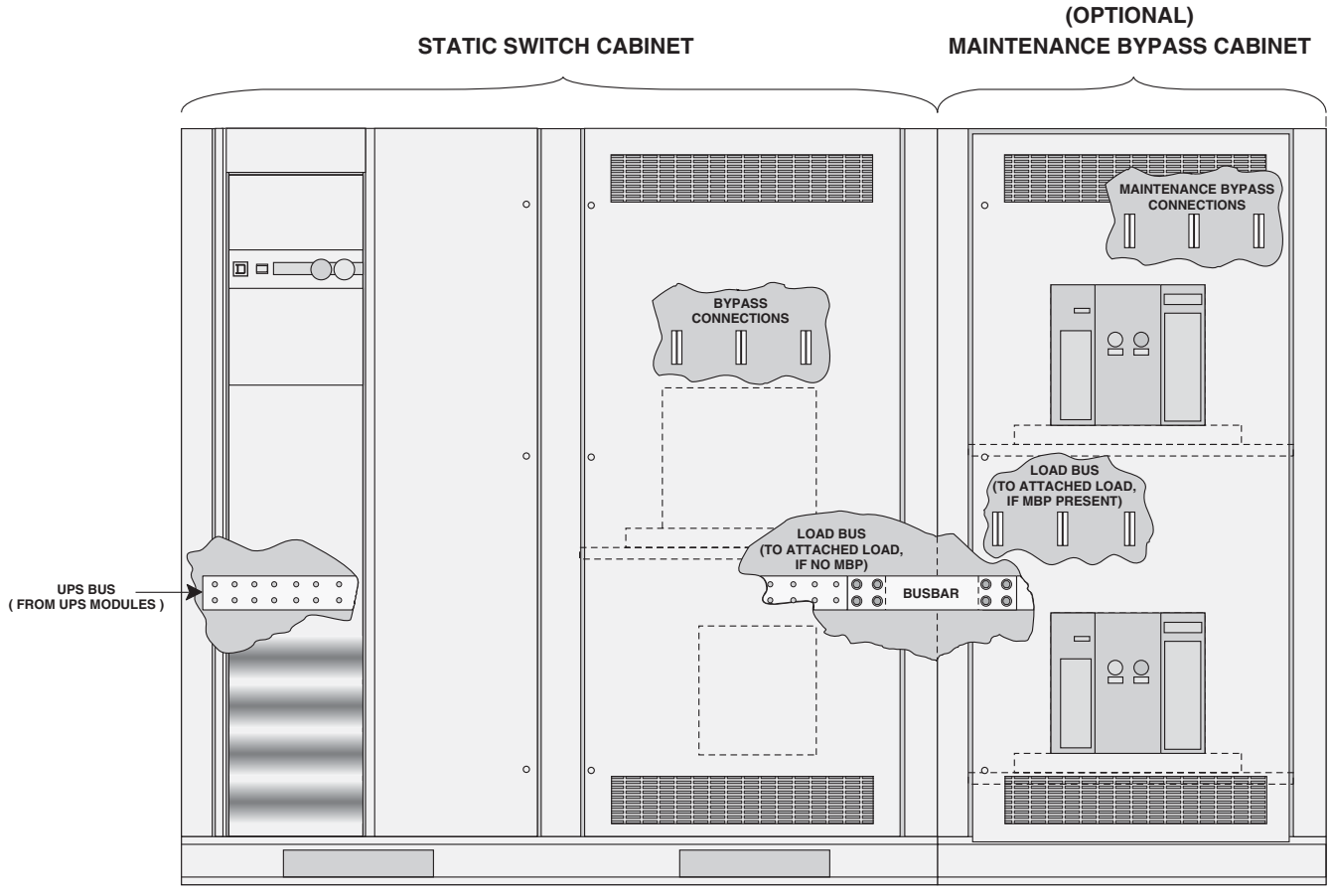
3.3.2 Shared System Bypass AC Input (Mains 2) Connections

The bypass AC input source is connected to the SSC. The connections to be made are the three phases, optional neutral, and ground connections. Termination of these connections within the SSC are marked on the installation drawings supplied with the equipment.

If the maintenance bypass option is included, the maintenance bypass AC input source is connected to the MBP. The connections to be made are the three phases, optional neutral, and ground connections. Termination of these connections within the MBP are marked on the installation drawings supplied with the equipment.

Upstream Bypass circuit breaker must be provided with 24vdc shunt trip and aux contact and connect to the SSC terminal block provided for.

Figure 3-2: Shared System Busbars, Circuit Breakers, and Conduit Landing Panel, SSC


STATIC SWITCH CABINET
(OPTIONAL)
MAINTENANCE BYPASS CABINET
MAINTENANCE BYPASS CONNECTIONS
BYPASS CONNECTIONS
LOAD BUS (TO ATTACHED LOAD, IF MBP PRESENT)
LOAD BUS (TO ATTACHED LOAD, IF NO MBP)
BUSBAR
UPS BUS (FROM UPS MODULES)

3.3.3 Battery Connections

The connections to be made are the positive (+), negative (–), and enclosure ground connections between the battery cabinet and the UPS module. Additionally, control connections between the battery temperature sensor and the UPS module must be installed. Refer to the installation drawings supplied with the UPS, the battery cabinet, and the battery temperature sensor.

3.3.4 Power Connections, Inter-Cabinet

The connections to be made vary depending on your system configuration. Typically, EPS 7000 systems are designed to make interconnection easy to complete and verify; however, always follow the installation drawings provided with the system.

Most inter-cabinet cables and hardware are provided by MGE; the customer is responsible for installing these cables. Cable ends are labeled to match the termination points. Some cabling must be supplied and installed by the customer. The installation drawings supplied with the system give complete details.

3.4 AC Output Connections for Single Module and Shared Systems

3.4.1 Single Module

The connections to be made are the three phases, ground and optional neutral cables. In units with MBP, the output connections are made at the MBP cabinet.

The customer is responsible for supplying upstream protective devices and downstream distribution circuits and protective devices as appropriate to the installation and distribution requirements; cable sizing data is provided on the installation drawings.

3.4.2 Shared Systems

The connections to be made are the three phases, ground, and optional neutral cables between the SSC output and the load to be supplied. Cables may be routed through the top or bottom of the SSC and optional MBP enclosures.

The customer is responsible for supplying downstream distribution circuits and protective devices as appropriate to the installation and distribution requirements; cable sizing data is provided on the installation drawings.

3.4.3 Customer Control Connections

Control, communication, and remote annunciation connections are made at the auxiliary contacts at the circuit boards located in the top portion of the UPS module. Printed circuit assemblies IBEZ and OBEZ provide a dry contact interface. Printed circuit assembly RAUZ provides telecommunication capability. Refer to the UPS installation drawings for contact information. For detailed information on the communication features, contact your MGE dealer.

3.5 Control Connection, Inter-Cabinet

3.5.1 Shared Systems Connections

Three sets of control cabling must be connected between the UPS modules and the SSC. The cables and hardware are supplied by MGE. Requirements vary according to the system configuration; general information follows.

The display connections are daisy-chained from the RAUZ PCA in the SSC to the RAUZ PCA in each UPS module.

Control signals for synchronization, transfer, and emergency power off (EPO) commands are connected between the UPS modules and the SSC. The control signals form a star connection from the ACPZ PCA in the SSC to the ACPZ PCA in each UPS module.

Current sharing control signals allow load sharing by the UPS modules. These cables are in a loop-type configuration, from the APOZ PCA in the first UPS module, continuing to the APOZ PCA in the last UPS module, then back to the APOZ PCA in the first UPS module.

Ribbon and control connectors are to be plugged into corresponding receptacles located in the UPS cabinet. Verify that all connectors are locked in properly.

3.6 Finishing the Installation

Once all connections have been completed, install the kick plates at the base of all enclosures, as appropriate to your installation. Side plates must be installed first, then back and front plates. For installations flush-mounted against back or side walls, those kick plates can be left off.

3.7 Start-up

Start-up presents the procedure to be used for preparation of power-up of the EPS 7000. Use this section in conjunction with the EPS 7000 User's Manual (MGE part number S-M, 86-134004-00, which details the start-up procedures, operation, controls, and indicators utilized during start-up.

3.7.1 Checks Before Start-up

Before starting the EPS 7000, read thoroughly the EPS 7000 Users Manual (MGE part number 86-134005-00-00/ 86-134004-00). Be certain that you fully understand the operation of the indicators, controls, and operational sequences.

Before starting the EPS 7000, make certain that these conditions exist (as applicable to your installation):

- All power and control wires have been properly connected and securely tightened.
- The upstream and downstream protective devices are not tripped, and have been sized properly for the UPS inrush and load requirements.
- The input voltage is the same as indicated on the UPS nameplate, located inside the right door of the EPS 7000 module.
- The air filters located inside each EPS 7000 module front door are properly installed and free of dust, dirt, and debris. Make certain that no objects block the air intake around the front bottom of the enclosures, and that the air exhaust at the top rear of the enclosures is free of obstructions.
- The UPS module input isolation circuit breaker Q1 is in the OFF (open) position.
- The bypass circuit breaker Q4S is in the OFF (open) position.
- The optional maintenance bypass circuit breaker Q3BP (if present) is in the OFF (open) position.
- The optional UPS isolation circuit breaker Q5N (if present) is in the OFF (open) position.
- The battery disconnect circuit breaker QF1 is in the OFF (open) position.

3.7.2 Checks After Start-up

After initial start-up of the system, normal operation should be tested. At the minimum, the following tests should be performed (refer to the EPS 7000 Users Manual for procedures), as applicable to your installation:

- Emergency power off (EPO) test.
- Remote emergency power off (REPO) test (if applicable).
- Inverter start and stop.
- Battery transfer test.
- Maintenance bypass procedure.

3.8 Shutdown

Shutdown procedures in this section apply to the EPS 7000 cabinet under normal, emergency, overload, and maintenance conditions.

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Maintenance

4.0 Scope

This section describes maintenance of the EPS 7000, including safety instructions, preventive maintenance, and information about replacement parts.

4.1 Safety Instructions

WARNING: **DC input power to the inverter is normally from a battery bank with a very high short-circuit capacity. Accidental welding and severe burns can be caused by mistakes while connecting or disconnecting these conductors.**

ATTENTION **L'entrée DC de l'onduleur est normalement alimentée par une batterie avee un courant de court-circuit élevé. Une erreur lors de la connexion ou deconnexion de ces conducteurs peut causer des soudures accidentelles et des brûlures sérieuses.**

WARNUNG! **Gleichstrom zum Wechselrichter kommt gewoehnlich von der Batteriebank mit einer sehr hohen Kurzschluss Leistungsfaehigkeit. Unbeabsichtigtes Schweissen und schwere Verbrennungen koennen die Folgevon fehlerhafter Verbindung und Trennung sein.**

4.2 IMPORTANT SAFETY INSTRUCTIONS FOR SERVICING BATTERIES

A. Servicing of batteries should be performed or supervised by personnel knowledgeable of batteries and the required precautions. Keep unauthorized personnel away from batteries.

B. When replacing batteries, use the same model and manufacturer of batteries.

C. **CAUTION** — Do not dispose of battery or batteries in a fire. The battery may explode.

D. **CAUTION** — Do not open or mutilate the battery or batteries. Released electrolyte is harmful to the skin and eyes. It may be toxic.

E. **CAUTION** — A battery can present a risk of electrical shock and high short-circuit current. The following precautions should be observed when working with batteries:

1. Remove watches, rings, or other metal objects.
2. Use tools with insulated handles.
3. Wear rubber gloves and boots.
4. Do not lay tools or metal parts on top of batteries.
5. Disconnect charging source prior to connecting or disconnecting battery terminals.
6. Determine if the battery is inadvertently grounded. If inadvertently grounded, remove the source of ground. Contact with any part of a grounded battery can result in electrical shock. The likelihood of such shock will be reduced if such grounds are removed during installation and maintenance.

4.3 Preventive Maintenance

The following preventive maintenance routines should be considered the minimum requirements; your installation and site may require additional preventive maintenance to assure optimal performance from your installed EPS 7000 and associated equipment. These routines should be performed twice a year (more often if required). We strongly recommend contracting MGE Customer Support Services for preventive and remedial maintenance.

The technician or electrician performing preventive maintenance on the UPS must thoroughly read this manual, and reference the EPS 7000 Single Module and Shared Systems Users Manuals (MGE part numbers 86-134004-00 and 86-134005-00), and be familiar with the indicators, controls, and operation of the UPS.

a. Isolate and de-energize all EPS 7000 equipment for all maintenance operations.

b. Ensure that all equipment is clean and free of loose dust, dirt, and debris. The exterior of the enclosures may be cleaned with a mild solution of soap and water, lightly applied with a lint-free cloth.

c. Inspect the air intake and exhaust plates and clean as required. Verify that air flows freely through the equipment. Clean the air intake and exhaust plates, and the enclosure interior, with a vacuum cleaner.

d. The EPS 7000 module is equipped with air filters that should be changed at regular intervals. Inspect the filters regularly to determine how long the filters will last in your installation.

e. Initiate the start-up procedure, as described in the User's manual.

f. Test the main operating sequences as applicable to your equipment configuration and installation.

4.4 Replacement Parts

There are no user replaceable parts inside the EPS 7000.

Three levels of replacement parts are available for the EPS 7000 UPS. The three levels are designated A, B, and C. The level that you should keep on hand for your installation will vary depending on the type of maintenance planned on site, and the configuration of your UPS system. Having the replacement parts on hand will prevent any unacceptable delays (due to time involved obtaining spare parts) during critical periods, such as system start-up.

Any items used during start-up will be replaced by MGE at no charge. Contact MGE Customer Support Services for specific recommendations. A description of each level is provided below:

Level	Description
A	This level of replacement parts consists of consumable items, specifically fuses and air filters. It is recommended to have these items on hand during installation of the UPS systems, including initial start-up.
B	This level of replacement parts is recommended when the user can tolerate short-duration UPS down-time to obtain replacement parts in the event of a major UPS failure. This level of replacement parts consists of consumable items, specifically fuses, air filters, an inverter leg, and the most critical circuit board assemblies.
C	This level of replacement parts is recommended when the user can tolerate only a minimum of down-time in the event of a major UPS failure. This level of replacement parts consists of consumable items, specifically fuses, air filters, an inverter leg, and a complete set of circuit board assemblies.

Glossary

Symbols	Definition / Meaning
@	At.
/	And/or.
+/-	PLUS or Minus.
≤	Equal to or less than.
#	Number.
°C	Degree Celsius.
°F	Degree Fahrenheit.
Ø	Phase angle.
Ω	Ohm; unit of resistance.
®	Trade Mark.
2nd	Second.
A, B, C	Normal sequence of phases (clockwise) in three-phase power.
AC or ac	Alternating current, also implies root-mean-square (rms).
Alphanumeric display	The LCD display above the hidden panel (behind the drop-down cover) on the UPS module and the SSC.
Ambient Temp.	Temperature of surrounding air.
Ambient noise	Acoustical noise of surrounding environment.
Ambient noise	The noise level of the environment.
Attached load	The load attached to the UPS output, such as a computer system or manufacturing system.
Audible alarm	A buzzer, located behind the front panel on the UPS module and the SSC, that sounds when alarm conditions occur.
ANSI	American National Standard Institute.
AWG	American Wire Gauge.
B or BAT. or BATT.	Battery.
Breaker	Electrical circuit interrupter.
BTU or Btu	British thermal unit. Defined as the amount of heat required to raise the temperature of one pound of water by 1°F.
BYPASS	See “Static Transfer switch”.
BYPASS mode	See “off-line mode”.
Carrier	The company or individual responsible for delivering goods from one location to another.

C	Common.
CB	Circuit breaker.
cm	Centimeter.
dB	Decibels.
DC	Direct current.
Conduit	A flexible or rigid tube enclosing electrical conductors.
C.S.S.	Customer Support Service.
Current rating	The maximum current that a conductor or equipment can carry reliably without damage.
dBA	Decibel Adjusted.
dBrnC	Decibel above reference noise.
DC or dc	Direct current, or voltage.
Digital Meter	The LCD display on the front panel of inverter system.
Earth ground	A ground circuit that has contact with the earth.
Electrician	Refers to an installation electrician qualified to install heavy-duty electrical components in accordance with local codes and regulations. Not necessarily qualified to maintain or repair electrical or electronic equipment.
FET	Field effect transistor.
Freq.	Frequency.
Frequency slew rate	The change in frequency per unit of time. Given in term of Hz per second (Hz/sec.).
GND	Ground (safety).
Hz	Hertz, frequency measurement unit, 1Hz is one cycle per second.
Input branch circuit	The input circuit from the building power panel to the equipment.
Inverter	An electrical circuit that generates an AC sinewave output from a DC input.
Inverter mode	See “on-line” mode.
I	Current.
IEC	International Electrotechnical Commission.
IEEE	Institute of Electrical and Electronic Engineers.
Input branch circuit	The input circuit from the building power panel to the equipment.
Inverter	An electrical circuit that generates an AC voltage source from a DC voltage source.
IGBT	Insulated gate bipolar transistors
kVA	KiloVolt-Ampere; is equal to 1000 Volt-Ampere.

L	Line.
LCD	Liquid-Crystal Display unit.
LED	Light Emitting Diode.
Load protected	The attached load is being supplied by the UPS module inverter output, and the battery is available in the event that incoming (utility) power is lost.
Load not protected Low battery	The attached load is being supplied, but the battery system is unavailable.
Shutdown	The battery has reached the lowest permitted operating voltage, and the inverter has shut down (disconnecting the load) to protect the battery from damage due to further discharge.
Mains or Mains 1	Main AC input source.
Mains 2	Bypass AC input source.
mA	Milliampere.
MAX.	Maximum.
MCM	Thousand circular mil; standard wire sizes for multiple stranded conductors over 4/0 AWG in diameter. M is from Roman numerical system indicating 1000.
Module	Refers to individual power inverter module.
N	Neutral.
NC	Normally close.
NO	Normally open.
NEC	National Electrical Code.
NFPA	National Fire Protection Association.
NO. or No.	Part number.
On-battery operation	The attached load is being supplied by the stored energy in the battery system.
On-line mode	Inverter output power is the primary energy source to load.
Off-line mode	Inverter output is off, and the load connected at the inverter output receives power from utility line via a static transfer switch or maintenance bypass relay.
OSHA	Occupational Safety and Health Agency.
PCB	Printed circuit assembly.
PCB	Printed circuit board.
PWM	Pulse Width Modulation.
Q1	UPS input isolation circuit breaker.
Q3BP	Optional maintenance bypass circuit breaker (in single-module UPS system); optional maintenance bypass circuit breaker in MBC cabinet (in shared systems).

Q4S	Control or bypass circuit breaker (in single-module UPS systems); user-supplied bypass AC input circuit breaker supplying the SSC (in shared systems).
Q5N	Optional UPS isolation circuit breaker (in single-module UPS systems); UPS module isolation circuit breaker (in shared systems); optional SSC isolation circuit breaker (in MBC).
QF1	Battery disconnect circuit breaker.
Remote emergency power off	A switch used for shutting down electrical equipment from a location away from the equipment.
SCR	Silicon controlled rectifier.
Security bypass (key)	Pushbutton on the hidden panel (UPS modules and SSC) allowing forced transfers and other commands to be issued. The security key pushbutton must be held down while the desired function is executed.
Shipping damage	Any damage done to an article while it is in transit.
SPDT	Single Pole Double Throw.
SSC	Static switch cabinet (in shared systems).
Static Transfer	An solid state switching mechanism electronically controlled to pass AC power directly from the utility to an output load.
Technician	Refers to an electronic technician qualified to maintain and repair electronic equipment. Not necessarily qualified to install electrical wiring.
Test connector	DB-9 type connector on the LCD panel allowing MGE UPS SYSTEMS Customer Support Service technician to access programmable and diagnostic features of the system.
U	Voltage.
UF	Under frequency.
UL	Underwriters Laboratories, Inc.
UPS	Uninterruptible power system.
UV	Under voltage.
VAC	Volts of alternating current.
Vb	Battery voltage (in volts DC).
VDC	Volts of direct current.
Via	By way of.
VPC	Volts per cell, the measure of the electrical potential of a storage cell, such as a battery.
XFMR	Transformer.
V	Volts
VA	Volt amperes

VA	Volt-amps, unit for apparent power measurement, equal V x I.
VAC or Vac	Voltage of AC type.
VDC or Vdc	Voltage of DC type.
ve	Battery voltage.
Via	By way of.

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